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Title: **Method and System for Alerting a User when the Registered Location of a Fixed Wireless Device is Incorrect**

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BACKGROUND

1. Field of Invention

The present invention relates to wireless devices that operate in wireless carrier networks, and more particularly to fixed wireless devices.

2. Description of Related Art

Wireless devices are communication devices that operate in conjunction with radio access networks to communicate with a variety of other devices and systems. A radio access network (RAN) typically includes an air interface, a base transceiver station (BTS), a base station controller (BSC), a coupling mechanism linking the BTS and the BSC, and a coupling mechanism linking the BSC to a mobile switching center (MSC). An air interface functions according to air interface protocol. Examples of air interface protocols include Advanced Mobile Phone Service (AMPS), Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), and Global System for Mobile communication (GSM). A wireless device may function with one or more air interfaces. A BTS is an interface between the air interface and a BSC and typically includes an antenna and a transceiver. A BSC is an interface between one or more BTSs and a mobile switching center (MSC). An MSC communicates with a signaling transfer point (STP), which is an interface between the MSC and other switches for setting up and tearing down telephone calls through the public switched telephone network (PSTN).

A wireless device may be a mobile wireless device or a fixed wireless device depending on the use of the wireless device. A mobile wireless device is a device that typically derives its power from a portable power supply such as a battery to allow the mobile wireless device to operate while moving from one location to another location. Alternatively, a mobile wireless

device may derive its power by coupling to a utility source extending to a fixed location and operate at the fixed location while deriving power from the utility source. For example, using a cellular phone to place a phone call while the cellular phone is charging its battery from an alternating current source at the fixed location. In contrast to mobile wireless devices, fixed wireless devices operate at fixed locations such as houses, offices, or factories and typically do not operate if the fixed wireless devices are moving from one fixed location to another fixed location. Fixed wireless devices usually derive power from a utility source extending to the fixed location. Alternatively, a fixed wireless device may derive its power from a portable power supply such as a battery.

To explain an exemplary fixed wireless device, it is helpful to understand part of a conventional telephone system in relation to part of a wireless carrier network. In a conventional telephone system, a local exchange carrier operates a central office that interfaces with the PSTN. The local exchange carrier provides landline telephone service at the customer premises of its customers. The central office includes a switch from which one or more pair of conductors extends to a junction box at a customer premises. Landline telephone equipment at the customer premises connect to the junction box via customer premises telephone lines. The conductors extending from the central office switch to the junction box at the customer premises are local loop telephone lines or a local loop. In a wireless carrier network, local loop telephone lines are not used. Instead, in a wireless carrier network, a wireless device interfaces with a RAN or more specifically to a particular wireless local loop (WLL). Each WLL of a RAN includes an air interface between a particular wireless device and a BTS, a coupling mechanism from the BTS to a BSC, and a coupling mechanism from the BSC to a mobile switching center (MSC). The MSC

in a wireless carrier network and a central office switch in a conventional telephone sytem both perform switching functions to set up and tear down calls via the PSTN.

Returning back to fixed wireless devices, an exemplary fixed wireless device is a wireless local loop (WLL) hub. A WLL hub typically operates at a fixed location and is an interface for conventional landline telephone equipment and a wireless local loop of a RAN. A RAN may include several wireless local loops. Coupling landline telephone equipment to a WLL hub allows the landline telephone equipment to access the PSTN without any local loop telephone lines extending to the landline telephone equipment. Examples of landline telephone equipment include telephones, modems, answering machines, and facsimile machines. The RAN interface at a WLL hub may take many forms. For example, the WLL hub may include a RAN interface internal to the WLL hub. Alternatively, the WLL hub may couple to a mobile wireless device to obtain a RAN interface. For example, the WLL hub may include a docking station for coupling a cellular phone to the WLL hub. After installing a cellular phone in the docking station, the cellular phone is the RAN interface for the WLL hub. WLL hubs may provide other functionality as well. For example, a WLL hub may provide a dial tone for landline telephone equipment coupled to the WLL hub. Providing a dial tone to landline equipment coupled to the WLL hub is necessary because the landline telephone equipment does not receive a dial tone from a local exchange carrier since the local exchange carrier's local loop telephone lines do not extend to the landline telephone equipment coupled to the WLL hub.

Wireless carriers are entities that provide wireless service to wireless device users through a wireless carrier network. In the United States, the Federal Communications Commission (FCC) requires that wireless carriers route all phone calls made to the phone number 9-1-1 to a public safety answering point (PSAP). In the United States, the FCC also

requires that wireless carriers provide automatic location information (ALI) to the PSAP for the wireless device placing the 9-1-1 call. ALI may include cell site sector location information, latitude and longitude information, and the ten-digit dial callback number of the wireless device making the 9-1-1 call.

Wireless carriers use mobile positioning centers (MPC) to determine the location information of a wireless device and for forwarding ALI to the PSAP. In order for the MPC to forward ALI to the PSAP, the MPC must learn the location of the wireless device. A variety of methods including network-based methods and wireless-device-based methods are available for the MPC to determine the location of a wireless device. An example of a network-based method of determining the location of a wireless device is the angle of arrival method. The angle of arrival method uses the directional angle of wireless device signals and the location of multiple BTS that detect the directional angles to determine the location of a wireless device. Another example of a network-based method of determining the location of a wireless device is the time difference of arrival (TDoA) method. The TDoA method uses a plurality of location measurement units at various base transceiver stations to determine the position of a wireless device by comparing the times each location measurement unit receives a signal from the wireless device. An example of a wireless-device-based method of determining the location of a wireless device is a method using the global positioning system (GPS). A wireless device with capabilities to receive GPS signals can send location coordinates such as latitude, longitude, and elevation of the wireless device through the wireless carrier network to the MPC, which forwards the location to the PSAP. Another example of a wireless-device-based method of determining the location of a wireless device is a fixed wireless device sending a registered location of the fixed wireless device to the MPC, which forwards the registered location to the PSAP.

Registering the location of a fixed wireless device can occur at one or more data storage devices. The data storage device for storing a registered location may be internal or external to the fixed wireless device. An example of a data storage device external to the fixed wireless device is a database within the wireless carrier network that stores location information of fixed wireless devices. Registered locations may include a variety of location information. For example, a registered location may include a text string of the street address, city, and state indicating the location of a fixed wireless device. Alternatively, a registered location of a fixed wireless device may be a geo-code representation of the registered location. Examples of geo-code include a mailing ZIP code and a mail-carrier route number, a pre-defined set of x-y coordinates that represent a street address, or a set of global positioning system (GPS) coordinates that represent a certain latitude and longitude.

There are a variety of ways to enter location information of a fixed wireless device into the one or more data storage devices that store registered locations. For data storage devices internal to the fixed wireless device, the fixed wireless device may include a keyboard interface for receiving location information from keyboard entries. For data storage devices external to the fixed wireless device, the data storage device typically receives information from another device such as a server that receives location information sent across a network or from a keyboard entry. Other means for sending location information of a fixed wireless device to a data storage device both internal and external to the fixed wireless device are also available for registering a location of the fixed wireless device.

Entities that request a registered location of a fixed wireless device may receive a registered location that does not match the current location of the fixed wireless device. Moving the fixed wireless device from one fixed location to a new (current) fixed location may result in

the registered location not reflecting the current location. A problem may arise if the entity requesting the registered location of the fixed wireless device relies on the registered location. For example, a public safety answering point (PSAP) may request automatic location information based on the registered location. If the PSAP dispatches emergency personnel to a registered location that does not match the current location of the fixed wireless device, the emergency personnel may arrive at the current location of the fixed wireless device too late to assist the caller.

SUMMARY

The present invention helps to solve the foregoing problem by detecting when the registered location of a fixed wireless device does not match the current location of the fixed wireless device and responsively enabling an alert. The alert serves as a prompt for a fixed wireless device user to change the registered location of the fixed wireless device to the current location of the fixed wireless device. By changing the registered location of the fixed wireless device to the current location of the fixed wireless device, an entity requesting and/or relying on the registered location will receive and/or rely on accurate location information for the fixed wireless device.

In one embodiment of the present invention, a system includes data storage for storing a registered location of a fixed wireless device, location-determining logic for determining a current location of the fixed wireless device, and alert logic for providing an alert in response to a determination that the current location does not match the registered location of the fixed wireless device. The system may also include comparator logic for making the determination that the current location of the fixed wireless device does not match the registered location of the fixed wireless device. A processor in the system executes machine language instructions representing the location-determining logic, the alert logic, and the comparator logic.

According to this embodiment, the alert logic may provide various types of alerts. One type of alert is a visual alert. For example, the alert logic may provide a visual alert by lighting a light emitting diode. Alternatively, the alert logic may provide a visual alert by displaying a text message at a display. Some other types of alerts include audible alerts and/or sending a message to a user. For instance, the alert logic may provide for sending an email message to the user.

Alternatively, the alert logic may provide for playing an alert announcement to the user during a phone call.

In another embodiment, a wireless local loop hub includes data storage for storing a registered location of the wireless local loop hub, location-determining logic, comparator logic, and alert logic. In the embodiment, the location determining logic determines a current location of the wireless local loop hub. The comparator logic determines that the current location of the wireless local loop hub does not match the registered location of the wireless local loop hub. And the alert logic provides an alert in response to a determination that the current and registered locations of the wireless local loop hub do not match.

In yet another embodiment of the present invention, a method involves comparing a registered location of a fixed wireless device to a current location of the fixed wireless device and responsively activating an alert if the registered location of the fixed wireless device does not match the current location of the fixed wireless device. The performance of the comparing and activating functions may occur at the fixed wireless device. Alternatively, performing the comparing and activating functions may occur in a wireless carrier network. In the embodiment, the activating function may include activating a visual alert, activating an audible alert, activating a vibratory alert, or sending a message to a user. Examples of sending a message to a user include sending an e-mail message, a short message service (SMS) message, or a multimedia message service (MMS) message. Another example of a sending a message to the user is playing an alert announcement to the user during a phone call.

In still yet another embodiment of the present invention, a method includes comparing a registered location of a wireless local loop hub to a current location of the wireless local loop

hub and responsively activating an alert if the registered location of the wireless local loop hub does not match the current location of the wireless local loop hub.

These as well as other aspects and advantages of the invention will become apparent to those of ordinary skill in the art by reading the following detailed description, with reference where appropriate to the accompanying drawings. Further, it should be understood that the embodiments noted in this summary are not intended to limit the scope of the invention as claimed.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a block diagram depicting an exemplary embodiment of the present invention;

Figure 2 is a prior art drawing of wireless devices and components of a wireless carrier network;

Figure 3 depicts components of a system for determining the location of a wireless device;

Figure 4 is a block diagram depicting components of an exemplary fixed wireless device;

Figure 5 depicts an exemplary embodiment of the present invention in a wireless network; and

Figure 6 is a flow chart illustrating functions available of the present invention.

DETAILED DESCRIPATION OF EMEMPLARY EMBODIMENTS

1. Exemplary Embodiment

Figure 1 depicts an exemplary embodiment of the present invention for comparing a registered location of a fixed wireless device to the current location of the fixed wireless device and responsively activating an alert if the registered location does not match the current location. In the figure, a fixed wireless device 100 includes a processor 102, data storage 104, an alert device 106, and an antenna 108. The data storage 104 may include a block of data for storing the current location of the fixed wireless device. Alternatively, another data storage device may store the current location of the fixed wireless device. The antenna 108 sends and receives signals through a radio access network (RAN) 110. The RAN 110 is a part of a wireless carrier network that includes a server 112 and a wireless network data storage device 114. The wireless network data storage device 114 includes a space for storing a registered location of the fixed wireless device. Alternatively, another data storage device may store a registered location of the fixed wireless device. For example, data storage 104 at the fixed wireless device 100 may store a registered location of the fixed wireless device.

In operating the exemplary embodiment of Figure 1, an entity compares the registered location of the fixed wireless device from the wireless network data storage device 114 to the current location of the fixed wireless device from data storage 104. A variety of entities can make the comparison of the registered and current locations of the fixed wireless device. For instance, the server 112 may compare the registered and current locations of the fixed wireless device using comparator logic in the server 112. In order for the server 112 to make the comparison of the registered and current locations, the server 112 could receive the current location of the fixed wireless device from data storage 104 and the registered location of the

fixed wireless device from the wireless network data storage device 114. The server 112 may receive the current location of the fixed wireless device in a variety of ways. For example, the server 112 can receive the current location of the fixed wireless device from the fixed wireless device 100, which sends the current location via the radio access network 110. After receiving the current location of the fixed wireless device from the fixed wireless device 100 and a registered location from the data storage device 114, the server 112 can compare the registered and current locations using comparator logic.

Another example of an entity that compares a registered and current location of the fixed wireless device is the fixed wireless device 100. The fixed wireless device 100 may perform a variety of steps in order to compare the locations. For example, the fixed wireless device 100 may determine the current location of the fixed wireless device, determine the registered location of the fixed wireless device, and then compare the current and registered locations of the fixed wireless device. Determining the current location may be performed in a variety of ways. For example, the fixed wireless device 100 may include location-determining logic that determines the current location of the fixed wireless device from global positioning system (GPS) coordinates. Alternatively, the fixed wireless device 100 may determine the current location by receiving the current location from a location-determining device via the radio access network 110. Determining the registered location of the fixed wireless device may also be performed in a variety of ways. For example, the fixed wireless device 100 may request the registered location of the fixed wireless device from a data storage device internal to the fixed wireless device 100 such as data storage 104. Alternatively, the fixed wireless device 100 may request the registered location of the fixed wireless device from another entity such as the data storage device 114 via the radio access network 110. After receiving the current and registered locations of the fixed

wireless device, the processor 102 executes comparator logic machine language instructions to compare the registered and current locations of the fixed wireless device.

If the entity that compares the registered and current locations of the fixed wireless device determines that the registered and current locations do not match, the entity comparing the locations responds to activate an alert. Responding to activate an alert may involve a variety of actions. For example, if the fixed wireless device 100 compares the registered and current locations, the fixed wireless device 100 may respond to activate an alert by activating the alert device 106. Alternatively, if the server 112 compares the registered and current locations, the server 112 may respond to activate an alert by sending a signal via the radio access network 110 to the fixed wireless device 100 in order to activate the alert device 106.

Activating the alert when the registered location of the fixed wireless device does not match the current location of the fixed wireless device may include activating one or more types of alerts. For example, the alert may be a visual alert, an audible alert, or a vibratory alert. The alert may be at the fixed wireless device 100 or another location. An example of a visual alert at the fixed wireless device 100 is shown in Figure 1 as alert device 106 displaying a text message stating "Registered location is incorrect."

2. Overview of Wireless Devices and Wireless Carrier Network

Figure 2 depicts a variety of wireless devices functioning in a wireless carrier network including mobile wireless devices 200 and 202 and a fixed wireless device 204. Mobile wireless devices are wireless devices that are operable while the moving the devices from one location to another location. Usually batteries supply operating power to mobile wireless devices in order to allow the wireless devices to be mobile. Examples of mobile wireless devices operating by battery power include hand-held cellular phones and cellular phones integrated into motor

vehicles. In contrast to mobile wireless devices, fixed wireless devices typically are not operable while moving the fixed wireless devices from one location to another location. Fixed wireless devices usually receive power from a source that limits the mobility of the fixed wireless devices. For example, the fixed wireless device 204 may receive power from an alternating current outlet at a fixed location such as customer premises 206.

Figure 2 also depicts components of a wireless carrier network. Mobile wireless device 200 communicates with a base transceiver station (BTS) 208 via an air interface 210. Mobile wireless device 202 communicates with BTS 208 via an air interface 212 and fixed wireless device 204 communicates with BTS 208 via an air interface 214. Each of the air interfaces 210, 212, and 214 functions according to an air interface protocol. The air interface protocols for air interfaces 210, 212, and 214 may be the same air interface protocols or different air interface protocols. Each wireless device, 200, 202, and 204 may function with one or more air interface protocols. The BTS 208 interfaces with a base station controller (BSC) 216 which controls one or more base transceiver stations including BTS 208. The BSC 216 interfaces with a mobile switching center (MSC) 218 which interfaces with one or more base station controllers including BSC 216. The MSC 218 performs switching functions to switch calls to and from wireless devices 200, 202, and 204. The MSC interfaces with a signaling transfer point (STP) 220 to set up and tear down calls via the public switched telephone network (PSTN) 222 for wireless devices 200, 202, and 204.

In Figure 2, the air interface 214, BTS 208 and BSC 216 are part of a radio access network (RAN) 224. At customer premises 206, the customer premises equipment 226, 228, and 230 is coupled to fixed wireless device 204 but is not coupled to a landline telephone system. Examples of customer premises equipment include landline telephones, landline modems,

landline answering machines, or landline facsimile machines. The fixed wireless device 204 provides an interface for customer premises equipment 226, 228, and 230 to communicate via the RAN 224.

By example, the fixed wireless device 204 may be a wireless local loop hub. A wireless local loop hub interfaces to a mobile switching center via a RAN, which includes a WLL. An exemplary wireless local loop includes the air interface 214, BTS 208, BSC 216, the coupling mechanism linking the BTS 208 to the BSC 216, and the coupling mechanism linking the BSC 216 to the MSC 218. The exemplary wireless local loop and the wireless local loop hub permit the customer premises equipment 226, 228, and 230 to communicate with the MSC 218 and through the PSTN 222 without any local loop telephone lines of a conventional landline telephone system extending to the customer premises 206 or customer premises equipment 226, 228, and 230.

3. Location of Wireless Devices

Figure 3 depicts a fixed wireless device 300 at a fixed location 302 and a mobile wireless device 304 in a motor vehicle 306. Examples of the fixed location 302 include a house, a factory, or an office. Other examples of fixed locations are available. The fixed wireless device 300 and the mobile wireless device 304 use air interfaces to communicate with one or more base transceiver stations depending in part on the location of the wireless devices 300 and 304 in relation to the base transceiver stations 308, 310, 312, and 314.

One method of determining the current location of the fixed wireless device 300 and the mobile wireless device 304 includes using position determining equipment (PDE) 316, 318, 320, and 322 at base transceiver stations. PDE 316, 318, 320, and 322 interface with base transceiver stations 308, 310, 312, and 314 respectively in order to send PDE data to a base station controller

(BSC) 324. A mobile switching center (MSC) 326 interfaces with BSC 324 to receive PDE data originating from PDE 316, 318, 320, and 322. The MSC 326 then sends the PDE data to a mobile positioning center (MPC) 328. The MPC 328 includes appropriate logic to determine the current location of a wireless device from the PDE data. Upon determining the current location of a wireless device, the MPC 328 can send the current location of the wireless device to an entity that requests the current location data. A variety of entities may request current location data. For example, a public safety answering point (PSAP) 330 may request current location data for a wireless device after receiving a 9-1-1 call from the wireless device.

In addition to using PDE to determine a current location of a fixed or mobile wireless device, the current location of a fixed wireless device may be available by reading a registered location of the fixed wireless device from a data storage medium. A registered location exists after storing location information of the fixed wireless device in a data storage medium. A variety of data storage medium is available for storing a registered location. For example, the data storage medium may be at the fixed wireless device 300. Alternatively, the data storage medium may be at a location within a wireless carrier network. In Figure 3, data storage medium 332 is available for storing a registered location of the fixed wireless device 300. The data storage medium 332 may be a data base within a wireless carrier network.

There are several ways in which the data storage medium 332 can obtain location information of the fixed wireless device 300. For instance, the data storage medium can receive the location information by a user typing the location information at a keyboard 334 coupled to a server 336. The server 336 sends the location information to the data storage medium 332 via a data bus or other mechanism 338. Alternatively, the fixed wireless device 300 can initiate a packet data session between the fixed wireless device 300 and the server 334 in order to send the

location information to the server 334. In order to initiate a packet data session, the fixed wireless device 300 sends a packet data session origination request to one or more base transceiver stations such as BTS 312. BTS 312 sends the origination request to BSC 324, which passes the origination request or another message to a packet data serving node (PDSN) 340. The PDSN 340 and the fixed wireless device 300 establish a data link via an air interface between the fixed wireless device 300 and the BTS 312, the BTS 312, and the BSC 324. The PDSN 340 assigns an internet protocol (IP) address to the fixed wireless device 300 so that the server 336 can communicate with the fixed wireless device 300 through the PDSN 340 and a packet network 342. The packet network 342 connects the PDSN 340 and the server 336. After initiating the packet data session, a user at the fixed wireless device 300 can enter location information of the fixed wireless device 300. The fixed wireless device then sends the location information to the server 336 so that the server 336 can send the location information to data storage medium 332. Once the data storage medium 332 stores the location information of the fixed wireless device 300, the location information at the data storage medium 332 becomes a registered location of the fixed wireless device 300.

4. Exemplary Fixed Wireless Device

Figure 4 is a block diagram illustrating functional components of an exemplary fixed wireless device 400. As shown in Figure 4, fixed wireless device 400 includes a processor 402, location-determining logic 404, comparator logic 406, alert logic 408, data storage 410, and an alert device 412, all of which may be coupled together by a system bus or other mechanism 414. Alternatively, the processor 402 may include data storage for storing the location-determining logic 404, comparator logic 406, and the alert logic 408 as machine language instructions. Yet

another alternative is data storage 410 may include the location-determining logic 404, comparator logic 406, and the alert logic 408 as machine language instructions.

The processor 402 may comprise one or more general purpose or dedicated processors. One function of the processor 402 is executing machine language instructions. The location-determining logic 404, comparator logic 406, and alert logic 408 may be arranged as machine language instructions for execution by the processor. The processor 402 calls machine language instructions from a data storage device such as data storage 410 and then executes the machine language instructions.

The location-determining logic 404 includes the logic for determining the current location of the fixed wireless device 400. The location-determining logic 404 may receive data in a variety of ways to determine the current location of the fixed wireless device 400. For example, the location-determining logic 404 may use coordinate data from the global positioning system (GPS) to determine a current location. Another example is the location-determining logic may use a string of data representing an address or address coordinates to determine a current location of the fixed wireless device 400. The string of data representing the address or address coordinates may be input into the fixed wireless device 400 from a device (such as a keyboard) coupled to the fixed wireless device 400. Alternatively, the string of data representing the address or address coordinates may be input into the fixed wireless device 400 from a wireless network. For example, the wireless network may use position determining equipment to determine the current location of the fixed wireless device 400 and then convey the location information to the fixed wireless device 400 via a radio access network of the wireless network.

The comparator logic 406 provides for comparing a current location of the fixed wireless device 400 to a registered location of the fixed wireless device stored in data storage 410. The

comparator logic can determine that the current location does not match the registered location of the fixed wireless device and/or determine that the current location matches the registered location of the fixed wireless device. The comparator logic 406 can also determine that the current location and/or the registered location of the fixed wireless device are not available at the processor 402.

The alert logic 408 provides for activating an alert device 412 in order to alert a user of the fixed wireless device 400 that the current location of the fixed wireless device does not match the registered location of the fixed wireless device. Activating the alert device 412 may include prompting the alert device 412 to transmit a message, such as an e-mail message or to play an alert announcement during a phone call. Alternatively, activating the alert device 412 may include enabling a continuous alert while the current location of the fixed wireless device does not match the registered location of the fixed wireless device. Examples of continuous alerts include driving a light emitting diode to the on-state and enabling a driver to supply a continuous tone at a speaker. Yet another alternative is to provide a periodic alert. An example of a periodic alert is to provide a vibratory alert at a paging device at some regular interval.

The alert logic 408 can also provide for disabling the alert device 412. For example, disabling the alert device 412 may occur when the comparator logic 406 determines that the current location of the fixed wireless device matches the registered location of the fixed wireless device. Alternatively, disabling the alert device 412 may occur after a user of the fixed wireless device 400 performs a specified sequence of events, such as pressing buttons on the fixed wireless device 400 in a certain order.

There are various types of data storage that can be used for data storage 410. For example data storage 410 may comprise volatile and/or non-volatile memory. Data storage 410

may be integrated into another device such as the processor 402. The data storage 410 includes segments that hold particular items of data. For example, data storage 410 includes a block of data for holding the registered location of the fixed wireless device 400. The data storage 410 may also store the location-determining logic 404, the comparator logic 406, and the alert logic 408 as machine language instructions for execution by the processor 402.

The alert device 412 may provide a visual alert. Examples of an alert device providing a visual alert include a light emitting diode emitting light and a liquid crystal display displaying a text message. Alternatively, the alert device 412 may provide an audible alert. Examples of an alert device providing an audible alert include playing an alert tone at a speaker or a buzzer. Still another alternative, alert device 412 may be a device that sends a message. Examples of messages sent by alert device 412 include email messages, short-message-service (SMS) messages, and audible messages played during a phone call.

5. Exemplary Embodiment in a Network

There are many ways to carry out the present invention in a network. Figure 5 depicts an exemplary embodiment for carrying out the present invention in a wireless carrier network. In the figure, a server 500 includes location-determining logic 502, comparator logic 504, and alert logic 506. The location-determining logic 502, comparator logic 504, and alert logic 506 may be machine language instructions executable by the server 500. The server 500 communicates with a data storage device 508, which may be external to the server 500 as shown in Figure 5 or alternatively may be internal to the server 500. An example of the server 500 communicating with the data storage device 508 is the server 500 sending location information of a fixed wireless device to the data storage device 508. After the data storage device 508 receives the location information, the data storage device 508 stores the location information as a registered

location of the fixed wireless device. Another example of the server 500 communicating with the data storage device 508 is the server 500 requesting the registered location of the fixed wireless device from the data storage device 508. After the server 500 receives the registered location of the fixed wireless device, the server 500 can compare the registered location to a current location of the fixed wireless device.

The fixed wireless device 510 is at customer premises 512 and is coupled to customer premises equipment (CPE) 514. An example of CPE 514 is a landline telephone. Information pertaining to the location of the fixed wireless device 510 may be stored as a registered location of the fixed wireless device. The registered location of the fixed wireless device may take many forms. For example, the registered location of fixed wireless device may include the street address of customer premises 512. Another example of the registered location of the fixed wireless device is the GPS coordinates for the customer premises 512. Storing the registered location of the fixed wireless device may occur at a variety of data storage devices. For example, storing the registered location of the fixed wireless device may occur at the data storage device 508. Alternatively, storing the registered location of the fixed wireless device may occur at the fixed wireless device 510.

The fixed wireless device 510 communicates with the server 500 using an air interface 516, a base transceiver station (BTS) 518, a base station controller (BSC) 520, a packet data serving node (PDSN) 522, and a packet network 524. In the exemplary embodiment, the fixed wireless device 510 sends location information of the fixed wireless device 510 to the server 500. The server 500 then forwards the location information of the fixed wireless device 510 to the data storage device 508. Upon storing the location information of the fixed wireless device 510

in the data storage device 508, the location information of the fixed wireless device 510 becomes a registered location of the fixed wireless device at the data storage device 508.

In addition to the registered location of the fixed wireless device, the server 500 in the exemplary embodiment requires the current location of the fixed wireless device in order to compare a registered location to a current location. The server 500 includes location-determining logic which may be arranged as machine language instructions executable by the server 500 to determine the current location of the fixed wireless device. The location-determining logic machine language instructions may perform a variety of functions in order to determine the current location of the fixed wireless device. For example, the location-determining logic machine language may instruct the server 500 to request the current location of the fixed wireless device from the fixed wireless device 510 via the packet network 524, PDSN 522, BSC 520, BTS 518, and the air interface 516. Alternatively, the location-determining logic machine language may instruct the server 500 to request the current location of the fixed wireless device from the data storage device 508.

Data storage 508 may obtain the current location of the fixed wireless device from a mobile positioning center (MPC) 526. The MPC may use a variety of methods to determine the current location of the fixed wireless device. In the exemplary embodiment, the MPC 526 determines the current location of the fixed wireless device by receiving and processing data originating at a plurality of position determination equipment (PDE). For example, one piece of PDE 528 at BTS 518 provides data (PDE data) to the BTS 518. The BTS 518 sends the PDE data to BSC 520. The BSC 520 sends the PDE data to a mobile switching center (MSC) 530, which forwards the PDE data to a signaling transfer point (STP) 532. The STP 532 sends the PDE data to MPC 526. The MPC 526 uses PDE data from a plurality of PDE including PDE

528 to determine the current location of the fixed wireless device. Upon determining the current location of the fixed wireless device, the MPC 526 may send the current location of the fixed wireless device to a variety of devices. For example, the MPC 526 may send the current location of the fixed wireless device to data storage device 508. Alternatively, the MPC 526 may send the current location of the fixed wireless device to the server 500.

Once the server 500 receives the registered and current locations of the fixed wireless device, the server 500 relies on comparator logic to compare the registered and current locations of the fixed wireless device. Alternatively, the comparator logic may include requesting the current and/or registered location of the fixed wireless device. The comparator logic may exist as machine language instructions executable by the server 500. An example of the comparator logic machine language instructions is an instruction for the server 500 to compare the current and registered locations of the fixed wireless device and to set a software flag in the server 500 to a particular state. The state of the software flag depends on whether the current location matches the registered location. Alternatively, the comparator logic machine language instruction may instruct the server 500 to send a signal to the data storage device 508 for the data storage device 508 to update a software flag in the data storage device 508. The software flag in the data storage device indicates whether the current location matches the registered location.

Finally, the server 500 includes alert logic which may exist as machine language instructions executable by the server 500. Executing the alert logic machine language instructions may occur after a software flag indicating whether the current location of the fixed wireless device matches the registered location of the fixed wireless device changes states. For example, the alert logic machine language instructions may result in sending an alert-on signal through the packet network 524, PDSN 522, BSC 520, BTS 518, and air interface 516 to the

fixed wireless device 510 when the current location of the fixed wireless device does not match the registered location of the fixed wireless device. Upon receiving an alert-on signal, the fixed wireless device may activate an alert device 534 located at the fixed wireless device 510. Alternatively, the alert logic machine language instructions can result in sending an alert-off signal to the fixed wireless device 510 when the current location of the fixed wireless device matches the registered location of the fixed wireless device.

6. Exemplary Operation

Figure 6 is a flow chart illustrating some of the functions in a method of using the exemplary embodiments to provide an alert when the current location of a fixed wireless device does not match the registered location of the fixed wireless device.

As shown in Figure 6, at block 600, the method involves comparing the current location of a fixed wireless device to a registered location of the fixed wireless device. The next step shown at block 602 is to activate an alert if the registered location of the fixed wireless device does not match the current location of the fixed wireless device. Activating the alert can prompt a user of the fixed wireless device to update the registered location of the fixed wireless device to the current location of the fixed wireless device.

7. Conclusion

Exemplary embodiments of the present invention have been described above. Those skilled in the art will understand, however, that changes and modifications may be made to the embodiments described without departing from the true scope and spirit of the present invention, which is defined by the claims.